

**REMARKS**

References to Applicant's specification herein cite paragraph numbers of the published U.S. Application No. 2005/0095191.

**Status of the Claims**

Claims **10-13** have been elected for examination. Claims **1-9** and **14-40** have been withdrawn from consideration as being drawn to a non-elected invention. In the Office Action, claims **10-13** were rejected under 35 USC § 112, first and second paragraphs, as allegedly failing to comply with the written description requirement and as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention.

Claims **10-12** were rejected under 35 USC § 102(b) as allegedly anticipated by U.S. Pat. 5,132,105 to Remo (hereafter "Remo"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by U.S. Pat. 6,358,375 to Schwob (hereafter "Schwob"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by Japanese Pat. 11-140342 to Ueda (hereafter "Ueda"). Claims **10-11** were rejected under 35 USC § 102(b) as allegedly anticipated by a publication to Taylor, *et al.*, "The chemistry of fullerenes," *Nature* 1993; 363:685-693 (hereafter "Taylor"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by a publication to Donnet, *et al.*, "Fullerenic carbon in carbon black furnaces," *Carbon* 2000; 38: 1879-1902 (hereafter "Donnet I"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by a publication to Burden, *et al.*, "In situ fullerene formation – the evidence presented," *Carbon*, 1998; 36(7-8): 1167-1173 (hereafter "Burden I"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by an on-line publication to Burden, *et al.*, "In situ fullerene formation – the evidence presented," [http://acs.omnibooksonline.com/papers/1997\\_ii376.pdf](http://acs.omnibooksonline.com/papers/1997_ii376.pdf) (hereafter "Burden II"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by a publication to Berezkin, "Fullerenes as nuclei of carbon black particles," *Physics of the Solid State* 2000; 42(3) 580-585 (hereafter "Berezkin"). Claims **10-13** were rejected under 35 USC § 102(b) as allegedly anticipated by a publication to Cataldo, "The impact of a fullerene-like concept in carbon black science," *Carbon* 2002; 40: 157-162 (hereafter "Cataldo"). Claims **10-13** were rejected under 35

USC § 102(b) as allegedly anticipated by a publication to Donnet, “Black and white fillers and tire compound,” *Rubber Chem. Tech.* 1998; 71(3): 323-341 (hereafter “Donnet II”). Claims **10-11** were rejected under 35 USC § 102(b) as allegedly anticipated by U.S. Pat. 5,648,523 to Chiang, (hereafter “Chiang”).

Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Schwob. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Ueda. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Donnet I. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Burden I. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Burden II. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Berezkin. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Cataldo. Claims **10-13** were rejected under 35 USC § 102(b) as anticipated by, or in the alternative, under 35 USC § 103(a) as obvious over Donnet II.

With this Response, Applicant amends claims **10-13**. Applicant hereby adds new claims **41-58**. Support for the newly added claims can be found at least at paragraphs 0016 through 0022, **FIG. 2**, and TABLE 1. Upon entry of this Response, claims **10-13** and **41-58** will be presented for examination.

## **Additional Items**

### *Electrion/Restrictions*

The status identifiers of the claims have been corrected. Claims **10-13** and **41-58** are presented for examination.

### *Information Disclosure Statement*

Applicant’s counsel has requested further details relating to the private discussion between an inventor and Professor Mark Meier. Applicant’s counsel has learned that Professor John Howard became severely ill late last year, continues under treatment, and has not been able

to respond to requests. Applicant's counsel is communicating with the other inventors to determine the extent of public disclosure of information relating to functionalized fullerenes. The other inventors had no knowledge of any notes taken during a communication with Meier. As a result of our questions, a colleague of the inventors has provided to the inventors an article relating to functionalized fullerenes, which we include in an Information Disclosure Statement filed herewith. Applicant's counsel will continue investigating this matter and provide as soon as possible any further publicly-disclosed information known to the inventors relating to dichloromethano[60]fullerene or dibromomethano[60]fullerene in accordance with the duty of disclosure.

*Drawings*

In the filed application, the pages having figures were mistakenly numbered after page 19. No drawing is missing from the application

**35 USC § 112, Second Paragraph, Rejections of Claims: 10-13**

The Examiner, at page 4 of the Office Action, indicates that the phrase "chemically bonded to a surface" is unclear and that a "physical bond could be interpreted as one type of chemical bond." The Examiner also indicates that "chemically bonded" and "bonded to a surface" are unclear. Applicant submits that one skilled in the art would interpret "chemically bonded to a surface" to comprise valence bonding with surface atoms or surface molecules. Applicant submits that the term physical bond is broader than chemical bond, and necessarily cannot be read upon chemical bond. During the telephone interview of June 20, 2007, a distinction between physical bonding, *e.g.*, van der Waals bonding, and chemical bonding was set forth by inventor Prof. Jack Howard. Then, the Examiner appeared to acknowledge the distinction, as noted in the Examiner's Interview Summary: "Evidence supporting supporting a conclusion that the fullerene bonded to carbon black, as described in [prior art of record], is not bonded by a "chemical bond" could potentially obviate the rejection. It was agreed that a carbon-carbon bond (C-C) was a chemical bond."

For at least the reasons set forth above, Applicant submits that the invention as claimed in claim 10 particularly points out and distinctly claims the subject matter which applicant regards as the claimed invention. Applicant requests reconsideration and withdrawal of the rejection to

the extent it is maintained against the claims as amended.

**35 USC § 112, First Paragraph, Rejections of Claims: 10-13**

Applicant amends claims 10-13 to more particularly point out and distinctly claim the subject matter which the Applicant regards as a claimed invention.

The Examiner, on pages 5-9 of the Office Action, alleges that the invention as claimed in claim 10 was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, the Examiner questions whether the specification provides adequate support for “chemical bond.” Applicant submits that the specification provides sufficient description, at least at paragraph 0016, of at least one method to chemically bond fullerenes to a surface of a carbon material. Applicant has further provided a reduction to practice in the specification, at least at paragraphs 0016-0022, TABLE 1, and FIG. 2, demonstrating fullerenes chemically bond to a surface of bulk carbon material. Since the observed fullerenes, *e.g.*, inset of FIG. 2, were not removed by methods known to remove physically bound fullerenes, *e.g.*, bound by van der Waals forces, and were stable under HRTEM observation, it is concluded that the observed fullerenes were chemically bound to the surface of the bulk carbon material. Further, samples treated with functionalized fullerenes according to the disclosed method exhibited about an order of magnitude increase in attached fullerenic structures in a linear dimension, or about two orders of magnitude increase in surface area coverage, as compared to untreated samples (see TABLE 1) wherein all three samples were subjected to a toluene bath which can remove physically bound fullerenes, *e.g.*, bound by van der Waals forces, prior to sample analysis by HRTEM. One of the samples was further subjected to sonication while in the toluene bath. If the fullerenes were not chemically bound to the bulk material, the result would likely show no significant difference between the three samples, a result contrary to that obtained.

For at least the reasons set forth above, Applicant submits that the invention as claimed in claim 10 is described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Accordingly, Applicant requests reconsideration and withdrawal of the rejection of claims 10-13 to the extent it is maintained against the claims as amended.

### **35 USC § 102(b) Rejections of Claims: 10-13**

Applicant amends base claims **10** to recite:

A product comprising fullerenes chemically bonded to a surface of a bulk carbon material wherein the average surface area concentration of fullerenes is greater than about 300 molecules per square micron.

Support for the amendment can be found in the specification at least at paragraphs 0016 through 0022, **FIG. 2**, and **TABLE 1**. For convenience, the unit of micron has been used rather than nanometers (1 micron = 1000 nanometers). Thus an area concentration can be determined from **TABLE 1** as the square of the measured linear concentration.

In view of the amendment, a response to each and every rejection in the Office Action of claims **10-13** under 35 USC § 102(b) is obviated. However, Applicant submits that none of the cited art Remo, Schwob, Ueda, Taylor, Donnet I, Burden I, Burden II, Berezkin, Cataldo, Donnet II, or Chiang disclose or teach each and every aspect of Applicant's claimed invention. In particular, none of the cited references disclose a product comprising fullerenes chemically bonded to a surface of a bulk carbon material wherein the average surface area concentration of fullerenes is greater than about 300 molecules per square micron.

For at least the above reasons, Applicant requests reconsideration and withdrawal of the rejections of claims **10-13** under 35 USC § 102(b) with respect to each of Remo, Schwob, Ueda, Taylor, Donnet I, Burden I, Burden II, Berezkin, Cataldo, Donnet II, or Chiang to the extent the rejections are maintained against the claims as amended.

### **35 USC §§ 102/103 Rejections of Claims: 10-13**

In view of the amendment to base claim **10**, a response to each and every rejection in the Office Action of claims **10-13** under 35 USC §§ 102/103 is obviated. However, Applicant submits that none of the cited art Schwob, Ueda, Donnet I, Burden I, Burden II, Berezkin, Cataldo, or Donnet II teach or suggest, either alone or in combination, each and every aspect of Applicant's claimed invention. In particular, none of the prior art discloses or teaches a product comprising fullerenes chemically bonded to a surface of a bulk carbon material wherein the average surface area concentration of fullerenes is greater than about 300 molecules per square

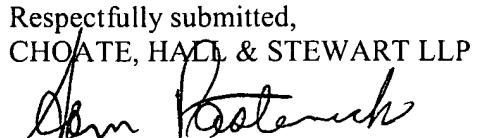
micron. Applicants inspected various carbon samples produced at high temperatures as described in the specification at least at **FIG. 1**, **FIGS. 4-6** and related discussions, and did not observe fullerenes or fullerene structures chemically bound to the surface of the bulk material in an average surface area concentration greater than about 144 molecules per square micron. For samples treated according to Applicant's methods, the area concentration observed was about two orders of magnitude greater than this value.

For at least the above reasons, Applicant requests reconsideration and withdrawal of the rejections of claims **10-13** under 35 USC §§ 102/103 with respect to each of Schwob, Ueda, Donnet I, Burden I, Burden II, Berezkin, Cataldo, or Donnet II to the extent the rejections are maintained against the claims as amended.

**CONCLUSION**

In view of the above, Applicant submits that all presently pending claims are in condition for allowance, and early indication thereof is respectfully requested. If the Examiner feels that a telephone call would expedite the prosecution of this case, the Examiner is invited to call the undersigned at (617) 248-5143.

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